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Washington, D.C. 20231

DOCKET NUMBER: AUS000065US1
JUNE 21, 2000

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Transmitted herewith for filing is the Patent Application of:

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For: AUTOMATICALLY SCALING ICONS TO FIT A DISPLAY AREA WITHIN A DATA PROCESSING SYSTEM
Enclosed are:

X Patent Specification and Declaration

X 14 sheets of drawing(s).

X An assignment of the invention to International Business Machines Corporation (includes Recordation Form Cover Sheet).

__ A certified copy of a__ application.

X Information Disclosure Statement, PTO 1449 and copies of references.

The filing fee has been calculated as shown below:

For	Number Filed	Number Extra	Rate	Fee
Basic Fee				$690.00
Total Claims	31	- 20	11 x 18 =	$198.00
Indep. Claims	9	- 3	6 x 78 =	$468.00
MULTIPLE DEPENDENT CLAIM PRESENTED			x 260 =	$0.00
			TOTAL	$1,356.00

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Respectfully submitted,

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AUTOMATICALLY SCALING ICONS TO FIT A DISPLAY AREA WITHIN A DATA PROCESSING SYSTEM

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates in general to data processing systems and in particular, the present invention relates to data processing systems for displaying icons. Still more particularly, the present invention relates to data processing systems for scaling icons to fit a display area.

2. Description of the Related Art:

Data processing systems commonly use icons to represent an object that can be manipulated by a user of the data processing system. Typical objects include programs, documents, images, sound files, video files, and macro instructions. The advantage of icons are that they serve as visual mnemonics and allow users to control certain computer actions without having to remember commands or type them in at the keyboard. Icons are a significant factor in the user-friendliness of graphical user-interfaces.

Data processing systems utilizing icons have display screens with wide-ranging capabilities. Some data processing systems, such as small handheld devices, have screen sizes as small as three inches by three inches.

The small physical size of the screen in such a system limits the amount of information that can be displayed on the screen and still be large enough to be read by a user of the data processing system. In other data processing systems, the physical size of the screen is very large and the screen can display information at a very high resolution. When viewing information designed for a standard screen on such a high resolution system, information appears to be physically compressed. Due to this compression, the displayed information can appear so small that the user is unable to read or recognize the information.

With reference to FIG. **1**, there is illustrated a graphical representation of a typical video display **102** with a display screen **104** displaying window **106**. This figure depicts a system that may have a small physical size, such as a handheld computer. Within window **106** are displayed icons **108**. Due to the small screen size, icons **108** appear very large and they do not all fit within the dimensions of window **106**. As a result, several icons are hidden from view and are not readily accessible by the user. In order for a user to gain access to these icons, the user must scroll window **106** down so that the hidden icons can be displayed within window **106**. A consequence of scrolling window **106** is that some of the icons located at the top of window **106** will be scrolled beyond the upper dimension of window **106** and become inaccessible. Scrolling the window to gain access to hidden icons diminishes some of the efficiency of an icon.

With reference to FIG. **2**, there is depicted a graphical representation of a typical video display **102** with a display screen **104** displaying window **202**. This figure illustrates a system that may have a large screen size with the display set at a high resolution mode. Within window **202** are displayed icons **204**. Due to the large physical size of the screen and the high resolution display mode, icons **204** appear very small. Due to their small size, icons **204** are difficult to see and read thereby making it difficult to locate and utilize a particular icon. If a desired icon cannot be easily located and utilized, its usefulness is diminished.

Manually scrolling the screen to reveal hidden icons or hunting to find a difficult to identify icon is undesirable and inconvenient. Accordingly, as is apparent from the foregoing description, it would be desirable to provide an improved method of displaying icons on a video screen by scaling the icons within a minimum and maximum size to fit the available area of the video screen.

The present invention relates in general to data processing systems and in particular, the present invention relates to data processing systems for displaying icons. Still more particularly, the present invention relates to data processing systems for scaling icons to fit a display area of a video screen.

SUMMARY OF THE PRESENT INVENTION

It is therefore one object of the present invention to provide an improved data processing system for displaying icons.

It is another object of the present invention to provide an improved data processing system for scaling icons.

It is yet another object of the present invention to provide an improved data processing system for displaying icons by automatically scaling the size of icons.

The foregoing objects are achieved as is now described.

A method, system, and program is provided for displaying icons on a data processing system. The number of icons to be displayed on the computer screen is determined. The boundary area for displaying the icons on the computer screen is calculated. The sizes of the icons are then scaled to a size that allows all icons to be displayed in the boundary area while utilizing all available display space. The minimum and maximum sizes of the icons can be limited based on user preferences. If the icons cannot be scaled to fit within the boundary area using the user selected minimum size, then only a portion of the icon is displayed. In this manner, all icons are scaled and displayed at a size that utilizes the full boundary area of the display screen.

The above as well as additional objects, features, and advantages of the present invention will become apparent in the following detailed written description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

FIG. **1** illustrates a graphical representation of a conventional video display screen displaying icons;

FIG. **2** depicts a graphical representation of a conventional video display screen displaying icons;

FIG. **3** illustrates a pictorial representation of a data processing system, which may be utilized to implement a preferred embodiment of the present invention;

FIG. **4** depicts a representative hardware environment of the data processing system illustrated in FIG. **3**;

FIG. **5a** illustrates a graphical representation of a video display screen on a hand held device displaying icons that may be utilized to implement a preferred embodiment of the present invention;

FIG. **5b** depicts a graphical representation of a video display screen displaying icons that may be

utilized to implement a preferred embodiment of the present invention;

FIG. **6a** illustrates a graphical representation of an icon, which may be utilized to implement a preferred embodiment of the present invention;

FIG. **6b** depicts a graphical representation of a graphic only icon, which may be utilized to implement a preferred embodiment of the present invention;

FIG. **6c** illustrates a graphical representation of a text only icon, which may be utilized to implement a preferred embodiment of the present invention;

FIG. **7a** depicts a graphical representation of a video display screen displaying scaled icons that may be utilized to implement a preferred embodiment of the present invention;

FIG. **7b** illustrates a graphical representation of a video display screen on a hand held device displaying scaled icons that may be utilized to implement a preferred embodiment of the present invention;

FIG. **8a** depicts a graphical representation of a video display screen displaying graphic only icons that may be utilized to implement a preferred embodiment of the present invention;

FIG. **8b** illustrates a graphical representation of a video display screen on a hand held device displaying graphic only icons that may be utilized to implement a preferred embodiment of the present invention;

FIG. **9a** depicts a graphical representation of a video display screen displaying text only icons that may be utilized to implement a preferred embodiment of the present invention;

FIG. **9b** illustrates a graphical representation of a video display screen on a hand held device displaying text only icons that may be utilized to implement a preferred embodiment of the present invention; and

FIG. **10** depicts a high level logic flow diagram that illustrates a method for scaling icons, according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention is described in a preferred embodiment in the following description with reference to the figures, in which like numbers represent the same or similar elements.

With reference now to the figures and in particular with reference to FIG. **3**, there is illustrated a pictorial representation of a data processing system **300** which may be utilized to implement a preferred embodiment of the present invention. A data processing system **300** is depicted that includes a system unit **302**, a video display **102**, a keyboard **306**, and a mouse **308**. Keyboard **306** is that part of data processing system **300** that resembles a typewriter keyboard and which enables a user to control particular aspects of the computer. Because information flows in one direction, from keyboard **306** to system unit **302**, keyboard **306** functions as an input-only device. Functionally, keyboard **306** represents half of a complete input/output device, the output half being video display **102**. Keyboard **306** includes a standard set of printable characters presented in a QWERTY pattern typical of most typewriters. In addition, keyboard **306** often includes a calculator-like numeric keypad at one side. Some of these keys, such as the "control," "alt," and "shift" keys can be utilized to change the meaning of another key. Other special keys and combinations of keys can be utilized to control program operations or to move either text or cursor on the display screen of video display **102**.

Mouse **308** is a commonly utilized pointing device. The basic features of a typical mouse include a casing with a flat bottom that is designed to be gripped by one human hand. A typical mouse also includes one or more buttons located atop the mouse, and a multidirectional detection device (e.g., usually a ball) located on the bottom of the mouse. A cable **310** connects mouse **308** to a computer such as data processing system **300**. By moving mouse **308** on a surface (e.g., a desk surface or a mouse pad), the user typically controls an on-screen cursor. Such a mouse is a relative pointing device, because the mouse's movement is not defined by limitations, and also because its placement on a surface does not map directly to a specific location on a computer screen. Generally, to select items or choose commands on a screen displayed graphical user interface, the user presses one or more mouse functions, producing a so-called mouse "click." The mouse can be utilized to manipulate a mouse pointer which is an on-screen element whose location changes as the user moves the mouse. Depending on the location of the mouse pointer and the operation of the program with which it is working, the area of the screen where the mouse pointer appears serves as the target for an action when the user presses one of the mouse buttons.

Data processing system **300** can be implemented utilizing any suitable computer such as the IBM ThinkpadÔ data processing system, a product of International Business Machines Corporation, located in Armonk, N.Y. However, those skilled in the art will appreciate that a preferred embodiment of the present invention can apply

to any data processing system, regardless of whether the computer is a complicated multi-user computing apparatus, a single user workstation, a laptop, a personal digital assistant, a palmtop, a hand held data processing device, or another portable computer.

With reference now to FIG. **4**, there is illustrated a representative hardware environment of the data processing system illustrated in FIG. **3**. Data processing system **300** includes a Central Processing Unit (CPU) **402**, such as a conventional microprocessor, and a number of other units interconnected via a system bus **414**. CPU **402** includes a portion of data processing system **300** that controls the operation of the entire data processing system, including the arithmetical and logical functions contain in a particular computer program. Although not depicted in FIG. **4**, CPU's such as CPU **402** typically include a control unit that organizes data and program storage in a computer memory and transfers the data and other information between the various parts of the data processing system. Such CPUs also generally include an arithmetic unit that executes arithmetical and logical operations, such as addition, comparison, multiplications and so forth. Such components and units of data processing system **300** can be implemented in a system unit such as system unit **302** of FIG. **3**.

Data processing system **300** further includes read-only memory (ROM) **404**, random-access memory (RAM) **406**, display adapter **416**, and Input-Output (I/O) adapter **408** for connecting peripheral devices (e.g., disk and tape

drives **410**) to system bus **414**. ROM **404** is a type of memory that retains information permanently and in which the stored information cannot be altered by a program or normal operation of a computer. RAM **406** is a type of memory designed such that the location of data stored in it is independent of the content. Also, any location in RAM **406** can be accessed directly without having to work through from the beginning.

Video display **102** is the visual output of data processing system **300**. Video display **102** can be a cathode-ray tube (CRT) based video display well known in the art of computer hardware. However, with a portable or notebook-based computer, video display **102** can be replaced with a liquid crystal display (LCD) based or gas plasma-based flat-panel display. Data processing system **300** further includes user interface adapter **418** for connecting keyboard **306**, mouse **308**, speaker **422**, microphone **420**, and/or other user interface devices, such as a touchscreen device (not shown), to system bus **414**. Communications adapter **412** connects data processing system **300** to a computer network. Although data processing system **300** is shown to contain only a single CPU and a single system bus, it should be understood that the present invention applies equally to data processing systems that have multiple CPUs and to data processing systems that have multiple buses that each perform different functions in different ways.

Data processing system **300** also includes an interface that resides within a machine-readable media to

direct the operation of data processing system **300**. Any suitable machine-readable media may retain the interface, such as, ROM **404** RAM **406**, a magnetic diskette, magnetic tape, or optical disk (the last three being located in disk and tape drives **410**). Any suitable operating system and associated interface (e.g., Microsoft Windows) may direct CPU **402**. For example, the AIX operating system and AIX windows windowing system can direct CPU **402**. The AIX operating system is IBM's implementation of the UNIX™ operating system. "UNIX" is a trademark of UNIX Systems Laboratories, Inc. Other technologies also can be utilized in conjunction with CPU **402**, such as touch-screen technology or human voice control. Operating systems typically include computer software for controlling the allocation and usage of hardware resources such as memory, CPU time, disk space, and peripheral devices. The operating system is the foundation upon which applications, such as word-processing, spreadsheet, and web browser programs are built.

Those skilled in the art will appreciate that the hardware depicted in FIG. **4** may vary for specific applications. For example, other peripheral devices such as optical disk media, audio adapters, or chip programming devices, such as PAL or EPROM programming devices well-known in the art of computer hardware and the like, may be utilized in addition to or in place of the hardware already depicted.

In addition, system memory **424** is connected to system bus **414**, and includes a web control program **426**. Control program **426** resides within system memory **424**, and contains instructions that, when executed on CPU **402**, carries out the operations described herein to display windows as illustrated in FIG. **7a**, **7b**, **8a**, **8b**. Control program **426** also can be referred to as a program product.

It is important to note that, while the present invention has been (and will continue to be) described in the context of a fully functional data processing system, those skilled in the art will appreciate that the present invention is capable of being distributed as a program product in a variety of forms, and that the present invention applies equally regardless of the particular type of signal-bearing media utilized to actually carry out the distribution. Examples of signal-bearing media include: recordable-type media, such as floppy disks, hard disk drives, and CD ROMs, and transmission-type media such as digital and analog communication links. Examples of transmission media include devices such as modems. Modems are communication devices that enable computers such as data processing system **300** depicted in FIG. **3** and FIG. **4** to transmit information over standard telephone lines.

With reference now to FIG. **5a**, there is depicted a graphical representation of video display **102** of a typical desktop data processing system which may be utilized to implement a preferred embodiment of the present invention. Video display **102** includes display

screen **104** which displays window **502**. Window **502** has a display width **506** and display height **508** and includes vertical scroll bar **510** comprising scroll up button **512** and scroll down button **524**. Window **502** displays vertical scroll bar **510** when there is insufficient room in window **502** to show all data loaded into window **502**. The area within window **502** is referred to as a screen page.

Scroll up button **512** and scroll down button **524** are responsive to user input and allow a user to shift the data displayed within window **502** up and down such that the user can see additional screen pages containing data not being displayed. Although not shown, window **502** can include a horizontal scroll bar to shift the data within window **502** left and right. When all data loaded into window **502** is displayed within the boundary of window **502**, then neither vertical scroll bar **510** nor a horizontal scroll bar is displayed.

As illustrated six icons, **504** are displayed within window **502**. An icon is a small image displayed on the screen to represent an object that can be manipulated by the user. By serving as visual mnemonics and allowing the user to control certain computer actions without having to remember commands or type them at the keyboard, icons **504** are a significant factor in the user-friendliness of graphical user interfaces. Icon images are typically generated from vector graphic files and bitmapped graphic files and can contain text.

Vector graphic images are generated from

mathematical descriptions that determine the position, length, and direction in which lines are drawn. Vector graphic objects are created as collections of lines rather than as patterns of individual dots or pixels. A vector graphic can be scaled by applying a scaling factor to the image's mathematical definition so that a reduced or enlarged version of the image can be displayed.

Bitmapped graphic images are represented as arrays of bits in memory that represent the attributes of the individual pixels in an image. Many methods of scaling a bitmapped graphic to display a reduced or enlarged version of the image are well understood by those skilled in the art.

Although FIG. **5a** illustrates utilizing video display **102** of a typical desktop data processing system to window **502**, it is appreciated that other data processing systems such as hand held devices may be utilized to implement a preferred embodiment of the present invention. For example, with reference now to FIG. **5b**, there is illustrated a graphical representation of a video display **103** of a hand held data processing system which includes display screen **105** which displays icons **504** in window **502** in an analogous manner to window **502** displaying icons **504** illustrated in FIG. **5a**. In typical hand held data processing devices, the physical dimensions of display screen **105** are so small, that window **502** often encompass the entire display screen **105**.

With reference now to FIG. **6a**, **6b**, and **6c**, there are depicted icons **600a**, **600b** and **600c** respectively which may be utilized to implement a preferred embodiment of the present invention. Icon **600a** includes both graphic image **602** and text **604**; icon **600b** only has graphic image **602**; and icon **600c** only has text **604**. With multiple icons types, a user can select their preferred icon type to be utilized when displaying icons. Additionally, when it is not practical to display the preferred icon type, the user could select an alternative icon type to be displayed instead. These alternative icon types could include a graphic only version such as icon **600b**, a text only version such as icon **600c**, or some other variation commonly used and well known in the art to abbreviate an image or an icon.

With reference now to FIG. **7a**, there is illustrated a graphical representation of video display **102** of a data processing system which may be utilized to implement a preferred embodiment of the present invention. Video display **102** includes display screen **104**, which displays twelve icons **704** in window **702**. According to the present invention, the sizes of icons **704** are scaled such that all twelve icons **704** can be fully displayed within window **702** without displaying a horizontal or vertical scroll bar. In this manner, a user of the data processing system may view and utilize each of the twelve icons **704** without the necessity of scrolling or resizing display window **702**.

It is appreciated that the present invention may be implemented on a variety of data processing systems. For example, with reference now to FIG. **7b**, there is depicted a graphical representation video display **103** of a hand held data processing device which may be utilized to implement a preferred embodiment of the present invention. As shown, video display **103** includes display screen **105**, which displays twelve icons **704** in window **702** wherein the sizes of icons **704** are scaled such that all twelve icons can be fully displayed within window **702**.

In some situations it may be preferable to limit the maximum and minimum display size of icons **704**. For example, when utilizing a small hand held data processing device, very small icons can be difficult to see and recognize. Additionally, users have different vision abilities and may wish to have a larger icons displayed on the display screen. Very large icons can also be problematic to a user. To control the final display size of icons **704**, a user may select a preferred icon size, a predetermined minimum icon size and a predetermined maximum icon size. The predetermined minimum icon size represents the smallest display size of icons **704**. The predetermined maximum icon size represents the largest display of icons **704**.

During situations in which all icons cannot be fully displayed in the display window utilizing the predetermined minimum icon size selected by the user, a partial version of the icon can be displayed. The style of the partial icon can be selected by the user according

to the users preferences.

In situations wherein the user does not wish to utilize partial icons or wherein all icons cannot be displayed in a window utilizing partial icons, the icons could be scaled and viewed on multiple display screens. For example, if twelve icons were loaded in a window but only eight icons would fit within the window display screen, then the icons would need to be viewed on multiple display screens. The methods of displaying these icons include, but are not limited to the following:

First, the icons could be scaled to a size such that a maximum number of icons, in this case eight, could be displayed within the current display window screen page. The remaining icons, in this case four, would be accessible by moving to the next screen page of the window. These four icons could be scaled, according to the user's preferences, to the same size as the previous eight, to a preferred icon size, or to another size necessary to fit the icons within the display window.

Second, the icons could be evenly distributed over the fewest window screen pages possible. In this example, since only eight icons will fit on one display screen page, two display screen pages are necessary to display all twelve icons. The twelve icons would be spilt evenly between the two display screen pages and then scaled to a preferred icon size or to another size necessary to fit the icons within the window. If there were thirteen icons instead of twelve, then seven could be displayed on the first page and six on the second.

With reference now to FIG. **8a**, there is depicted a graphical representation of video display **102** which may be utilized to implement a preferred embodiment of the present invention. Video display **102** includes display screen **104**, which displays twelve partial icons within window **802**. This figure represents a situation wherein the dimensions of window **802** prevent all twelve icons **804** from being fully displayed at a size equal to or greater than the predetermined minimum icon size selected by the user of the data processing system.

In order to display all twelve icons **804** within window **802**, a partial representation of icons **804** is utilized. In this example, icons **804** are represented without their text component in a manner analogous to icon **600b**. By removing the text from icons **804**, the modified icons can now be scaled to a size equal to or greater than the predetermined minimum icon size and to a size small enough so that they can all be displayed within the dimensions of window **802**. In this manner, a user of the data processing system may view and utilize each of the twelve partial icons **804** without the necessity of scrolling or resizing display window **802**.

With reference now to FIG. **8b**, there is depicted a graphical representation video display **103** of a hand held data processing device analogous to the video display **102** illustrated in FIG. **8b**. As shown, video display **103** includes display screen **105**, which displays twelve partial icons **804** in window **802** wherein the sizes of

icons **804** are scaled such that all twelve partial icons can be fully displayed within display window **702**. In this example, icons **804** are represented without their text component in a manner analogous to icon **600b**. In this manner, a user of the data processing system may view and utilize each of the twelve partial icons **804** without the necessity of scrolling display window **802**.

With reference now to FIG. **9a**, there is depicted a graphical representation of video display **102** which may be utilized to implement a preferred embodiment of the present invention. Video display **102** includes display screen **104**, which displays twelve partial icons within display window **902**. Analogous to FIG. **8a**, This figure represents a situation wherein the dimensions of window **902** prevent all twelve icons **904** from being fully displayed at a size equal to or greater than the predetermined minimum icon size selected by the user of the data processing system.

In order to display all twelve icons **904** within display window **902**, a partial representation of icons **904** is utilized. In this example, icons **904** are represented without their graphic component in a manner analogous to icon **600c**. By removing the graphic image from icons **904**, the modified icons can now be scaled to a size equal to or greater than the predetermined minimum icon size and to a size small enough so that they can all be displayed within the dimensions of window **902**. In this manner, a user of the data processing system may view and utilize each of the twelve partial icons **904** without the

necessity of scrolling or resizing display window **902**.

With reference now to FIG. **9b**, there is depicted a graphical representation video display **103** of a hand held data processing device analogous to the video display **102** illustrated in FIG. **9b**. As shown, video display **103** includes display screen **104**, which displays twelve partial icons **904** in window **902** wherein the sizes of icons **704** are scaled such that all twelve partial icons can be fully displayed within display window **702**. In this example, icons **904** are represented without their graphic component in a manner analogous to icon **600c**. In this manner, a user of the data processing system may view and utilize each of the twelve partial icons **904** without the necessity of scrolling display window **902**.

FIG. **10** illustrates a high-level logic flow diagram that illustrates a method for scaling and displaying icons, according to a preferred embodiment of the present invention. As depicted at block **1002**, the process is initiated. As illustrated at block **1004**, the number of icons to be displayed in a particular boundary area of the display screen is determined. As shown at block **1006**, the boundary area for displaying the icons is determined. Next, as depicted at block **1008**, a scale factor (SF) for scaling the icons is determined such that the icons can be displayed entirely within the boundary area.

As illustrated at block **1010**, a test is performed to determine whether the scale factor (SF) is less than the

predetermined maximum scale factor. If this test is true, then the process continues as described at block **1014**. If this test is false, then the process continues as described at block **1012**.

Next, as depicted at block **1014**, a test is performed to determine whether the scale factor (SF) is less than the predetermined minimum scale factor. If this test is true, then the process continues as described at block **1018**. If this test if false, then the process continues as described at block **1016**.

Thereafter, as depicted at block **1018**, a test is performed to determine whether the an alternative icon type should be utilized to display the icons. If this test is true, then the process continues as described at block **1022**. If this test if false, then the process continues as described at block **1020**.

Next, as illustrated at block **1024**, text is removed from the icon image. As depicted at block **1026**, graphics are removed from the icon image. As shown at block **1028**, the scale factor (SF) for scaling the icons is determined such that the icons can be displayed in the boundary area. This procedure is analogous to the procedure shown at block **1008**.

Still referring to FIG. **10**, as depicted at block **1030**, a test is performed analogous to the one illustrated at block **1010** to determine whether the scale factor (SF) is less than the predetermined maximum scale

factor. If this test is true, then the process continues as described at block **1032**. If this test is false, then the process continues through connector **A** to block **1012**.

Next, as depicted at block **1032**, a test is performed analogous to the one illustrated at block **1014** to determine whether the scale factor (SF) is less than the predetermined minimum scale factor. If this test is true, then the process continues through connector **C** to block **1020**. If this test is false, then the process continues through connector **B** to block **1016**.

Icon scale (IS) is set to a maximum value, as depicted at block **1012**. The maximum value represents the scale factor used to show the icons at their maximum size as selected by the user. As shown at block **1016**, icon scale is set to scale factor (SF). As illustrated at block **1020**, icon scale (IS) is set to a minimum value. The minimum value represents the scale factor used to show the icons at their maximum size as selected by the user. As depicted at block **1034**, the sizes of the icons are scaled by a factor of icon scale (IS). Thus, if icon scale (IS) is less than 1, the icon image size is reduced. If icon scale (IS) is greater than 1, the icon image size is enlarged. As illustrated at block **1036**, icons are displayed at their newly scaled size within the boundary area of the display screen. As depicted at block **1038**, the process is terminated.

While this invention is described in terms of the best mode for achieving this invention's objectives, it

will be appreciated by those skilled in the art that variations may be accomplished in view of these teachings without deviating from the spirit or scope of the present invention. For example, the present invention may be implemented using any combination of computer programming software, firmware or hardware. As a preparatory step to practicing the invention or constructing an apparatus according to the invention, the computer programming code (whether software or firmware) according to the invention will typically be stored in one or more machine readable storage mediums such as fixed (hard) drives, diskettes, optical disks, magnetic tape, semiconductor memories such as ROMs, PROMs, etc., thereby making an article of manufacture in accordance with the invention. The article of manufacture containing the computer programming code is used by either executing the code directly from the storage device, by copying the code from the storage device into another storage device such as a hard disk, RAM, etc. or by transmitting the code on a network for remote execution. The method form of the invention may be practiced by combining one or more machine-readable storage devices containing the code according to the present invention with appropriate standard computer hardware to execute the code contained therein. An apparatus for practicing the invention could be one or more computers and storage systems containing or having network access to computer program(s) coded in accordance with the invention.

As has been described, the present invention provides a method and system to automatically scale icons to be displayed on a display screen.

In a first aspect of the present invention, the sizes of the icons are reduced to fit within a boundary area of the display screen. According to a second aspect of the present invention, the sizes of the icons are increased to fit within a boundary area of the display screen.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A method of displaying icons within a data processing system having a display screen, comprising the steps of:

first determining a quantity of a plurality of icons to be displayed on a display screen of a data processing system;

second determining a designated area of said display screen for displaying said plurality of icons; and

automatically scaling each of said plurality of icons in response to said quantity of said plurality of icons and said designated area such that said plurality of icons can be displayed in said designated area of said display screen.

2. The method of Claim 1, wherein said step of first determining a quantity of a plurality of icons to be displayed on a display screen of a data processing system comprises first determining a quantity of plurality icons defined by vector graphics to be displayed on a display screen of a data processing.

3. The method of Claim 1, wherein said step of first determining a quantity of a plurality of icons to be displayed on a display screen of a data processing system comprises first determining a quantity of a plurality of icons defined by bitmapped graphics to be displayed on a display screen of a data processing system.

4. The method of Claim 1, further comprising the step of displaying said plurality of icons on said display screen.

5. The method of Claim 1, further comprising the step of displaying said plurality of icons on said display screen, wherein said plurality of icons comprise a graphic image and a text image.

6. The method of Claim 1, further comprising the step of displaying said plurality icons on said display screen, wherein said plurality of icons only comprise a text image.

7. The method of Claim 4, wherein said step of displaying said plurality of icons on said display screen, comprises displaying said plurality of icons on a display screen, wherein said display screen has a fixed pixel width and a fixed pixel height.

8. A icon scaling system for use with a data processing system having a display, said icon scaling system comprising:

a calculation routine that determines a quantity of a plurality of icons to be displayed on a display screen of a data processing system;

a boundary routine that determines a designated area of said display screen for displaying said plurality of icons; and

a scaling routine that automatically scales said plurality of icons in response to quantity of a plurality of icons and said designated area such that said plurality of icons can be displayed in said designated area of said display screen.

9. The system of Claim 8, wherein said plurality of icons are defined by vector graphics.

10. The system of Claim 8, wherein said plurality of icons are defined by bitmapped graphics.

11. The system of Claim 8, further comprising a display routine that displays said plurality of icons on said display screen.

12. The system of Claim 8, wherein said plurality of icons comprise a graphic image and a text image.

13. The system of Claim 8, wherein said plurality of icons comprise only a text image.

14. The system of Claim 8, wherein said display screen has a fixed pixel width and a fixed pixel height.

15. An article of manufacture for use in a data processing system for scaling icons on a display screen, the article of manufacture comprising computer readable storage media including program logic embedded therein that causes control circuitry to perform the steps of:

first determining a quantity of a plurality of icons to be displayed on a display screen of a data processing system;

second determining a designated area of said display screen for displaying said plurality of icons; and

automatically scaling said plurality of icons in response to said quantity of said plurality of icons and said designated area such that said quantity of said plurality of icons can be displayed in said designated area of said display screen.

16. The article of manufacture of Claim 15, wherein said step of first determining a quantity of a plurality of icons to be displayed on a display screen of a data processing system comprises first determining a quantity of a plurality of icons defined by vector graphics to be displayed on a display screen of a data processing.

17. The article of manufacture of Claim 15, wherein said step of first determining a quantity of a plurality of icons to be displayed on a display screen of a data processing system comprises first determining a quantity of a plurality of icons defined by bitmapped graphics to be displayed on a display screen of a data processing

system.

18. The article of manufacture of Claim 15, further comprising the step of displaying said plurality of icons on said display screen.

19. The article of manufacture of Claim 15, further comprising the step of displaying said plurality of icons on said display screen, wherein said plurality of icons comprise a graphic image and text image.

20. The article of manufacture of Claim 15, further comprising the step of displaying said plurality of icons on said display screen, wherein said plurality of icons only comprise a text image.

21. The article of manufacture of Claim 18, wherein said step of displaying said plurality of icons on said display screen, comprises displaying said plurality of icons on a display screen, wherein said display screen has a fixed pixel width and a fixed pixel height.

22. A method, for displaying icons within a data processing system having a display screen, comprising the steps of:

determining a size of a designated area of a display screen for displaying a plurality of icons;

displaying said plurality of icons within said determined size of said designated area by at least one of a) automatically scaling said icons; b) displaying a portion of each one of said plurality of icons; and c) creating a plurality of selectable displayed screen pages wherein each screen page has a portion of said plurality of icons displayed within said determined size of said designated area.

23. A method, for displaying icons within a data processing system having a display screen, comprising the steps of:

determining a size of a designated area of a display screen for displaying a plurality of icons;

utilizing a predetermined minimum size and a predetermined maximum size for an individual icon;

displaying said plurality of icons within said determined size of said designated area, based upon said predetermined minimum size and said predetermined maximum size, by at least one of a) automatically scaling said icons; b) displaying a portion of each one of said plurality of icons; and c) creating a plurality of selectable displayed screen pages wherein each screen page has a portion of the plurality of icons displayed within said determined size of said designated area.

24. The method of claim 23 wherein said predetermined minimum size and said predetermined maximum size are predetermined based on user input.

25. A data processing system having a display screen, comprising:

means for determining a size of a designated area of a display screen for displaying a plurality of icons;

means for displaying said plurality of icons within said determined size of said designated area by at least one of a) automatically scaling said icons; b) displaying a portion of each one of said plurality of icons; and c) creating a plurality of selectable displayed screen pages wherein each screen page has a portion of said plurality of icons displayed within said determined size of said designated area.

26. A data processing system for displaying icons on a display screen, comprising:

means for determining a size of a designated area of a display screen for displaying a plurality of icons;

means for utilizing a predetermined minimum size and a predetermined maximum size for an individual icon;

means for displaying said plurality of icons within said determined size of said designated area, based upon said predetermined minimum size and said predetermined maximum size, by at least one of a) automatically scaling said icons; b) displaying a portion of each one of said plurality of icons; and c) creating a plurality of selectable displayed screen pages wherein each screen page has a portion of the plurality of icons displayed within said determined size of said designated area.

27. The data processing system of claim 26 wherein said predetermined minimum size and said predetermined maximum size are predetermined based on user input.

28. The data processing system of claim 26 wherein the data processing system is a hand held device.

29. An article of manufacture for use in a data processing system for scaling icons on a display screen, the article of manufacture comprising computer readable storage media including program logic embedded therein that causes control circuitry to perform the steps of:

determining a size of a designated area of a display screen for displaying a plurality of icons;

displaying said plurality of icons within said determined size of said designated area by at least one of a) automatically scaling said icons; b) displaying a portion of each one of said plurality of icons; and c) creating a plurality of selectable displayed screen pages wherein each screen page has a portion of said plurality of icons displayed within said determined size of said designated area.

30. An article of manufacture for use in a data processing system for scaling icons on a display screen, the article of manufacture comprising computer readable storage media including program logic embedded therein that causes control circuitry to perform the steps of:

determining a size of a designated area of a display screen for displaying a plurality of icons;

utilizing a predetermined minimum size and a predetermined maximum size for an individual icon;

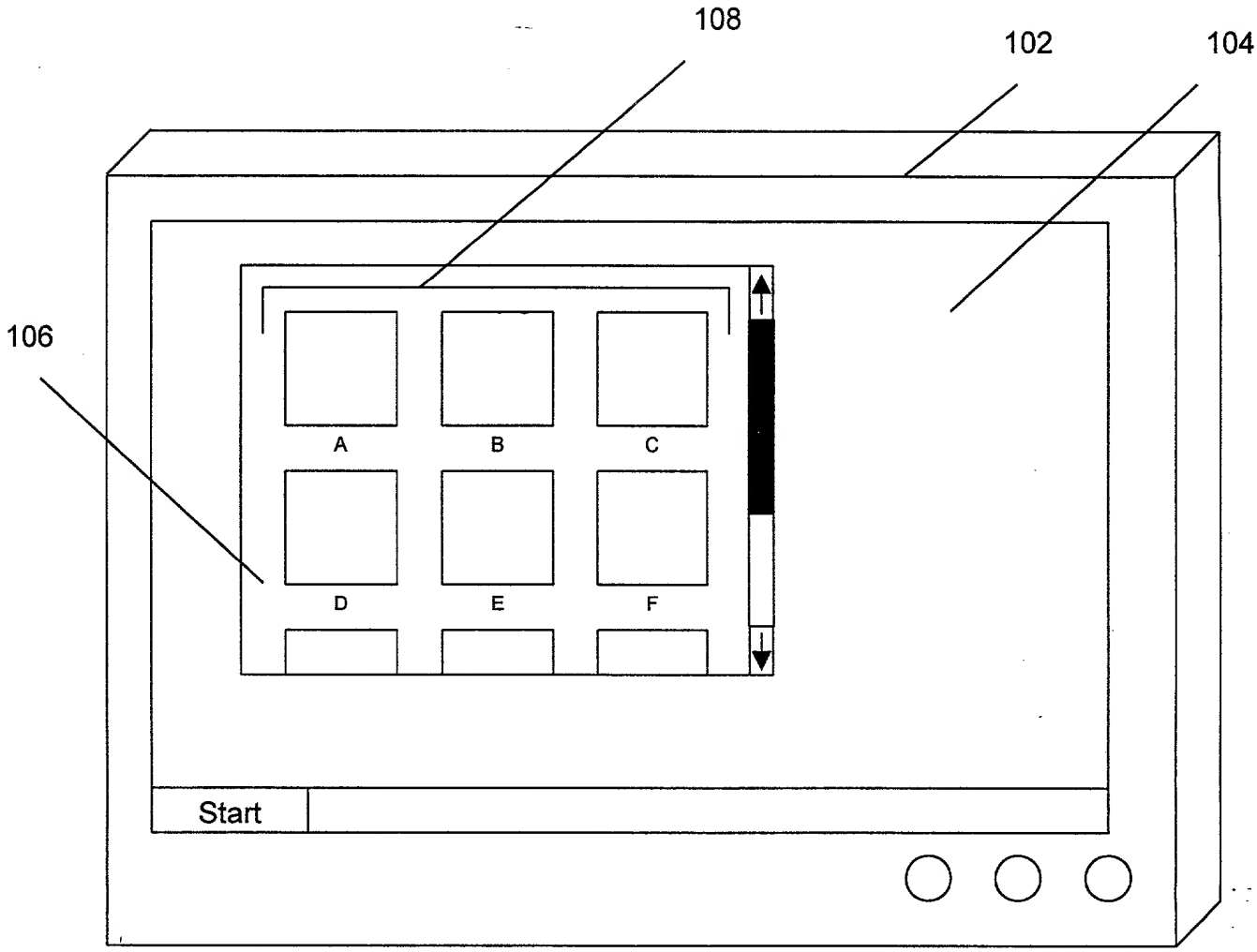
displaying said plurality of icons within said determined size of said designated area, based upon said predetermined minimum size and said predetermined maximum size, by at least one of a) automatically scaling said icons; b) displaying a portion of each one of said plurality of icons; and c) creating a plurality of selectable displayed screen pages wherein each screen page has a portion of the plurality of icons displayed within said determined size of said designated area.

31. The article of manufacture claim 23 wherein said predetermined minimum size and said predetermined maximum size are predetermined based on user input.

ABSTRACT OF THE DISCLOSURE

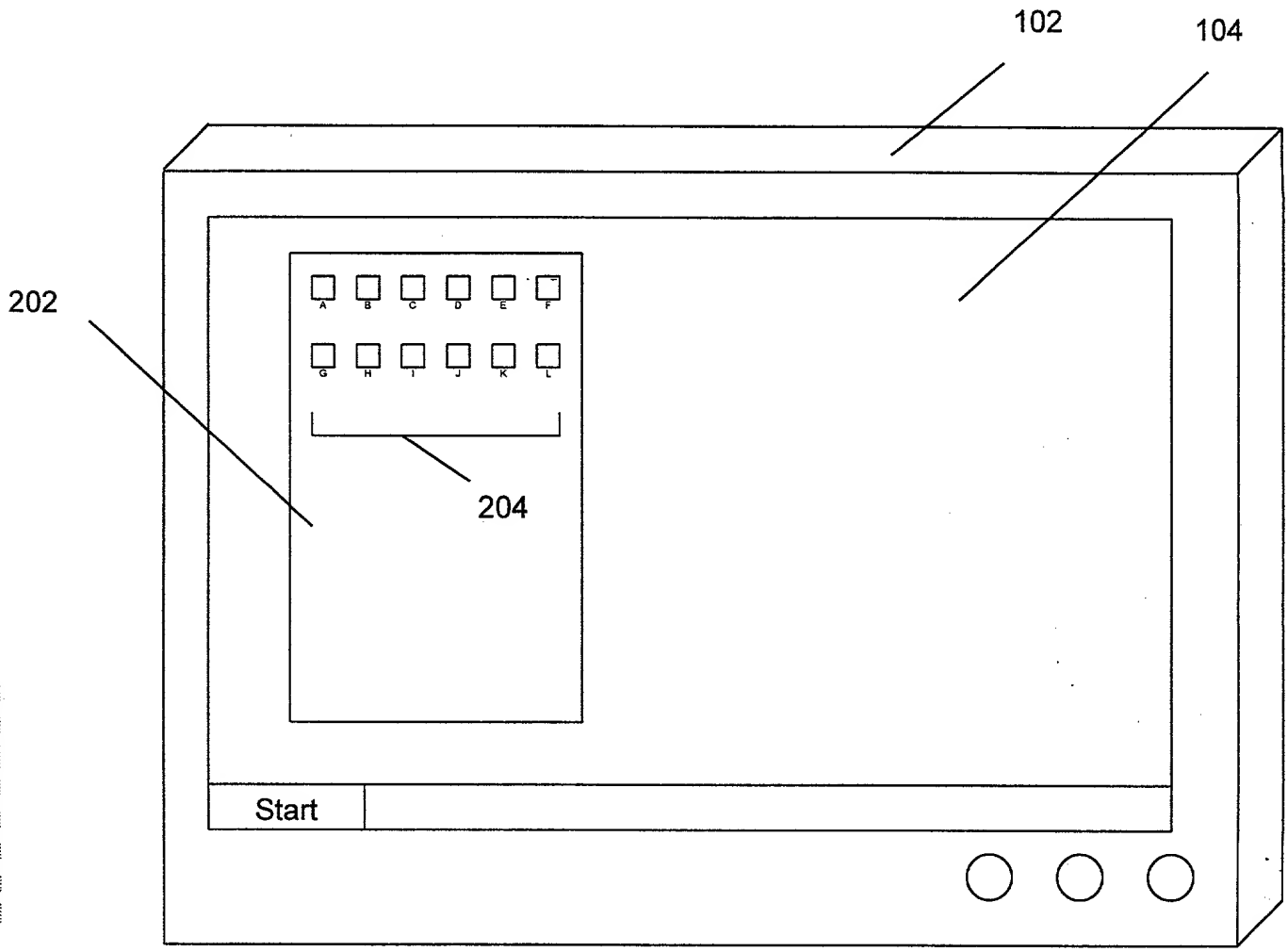
AUTOMATICALLY SCALING ICONS TO FIT A DISPLAY AREA WITHIN A DATA PROCESSING SYSTEM

A method, system, and program is provided for displaying icons on a data processing system. The number of icons to be displayed on the computer screen is determined. The boundary area for displaying the icons on the computer screen is calculated. The sizes of the icons are then scaled to a size that allows all icons to be displayed in the boundary area while utilizing all available display space. The minimum and maximum sizes of the icons can be limited based on user preferences. If the icons cannot be scaled to fit within the boundary area using the user selected minimum size, then only a portion of the icon is displayed. In this manner, all icons are scaled and displayed at a size that utilizes the full boundary area of the display screen.



PRIOR ART

FIG. 1



PRIOR ART

FIG. 2

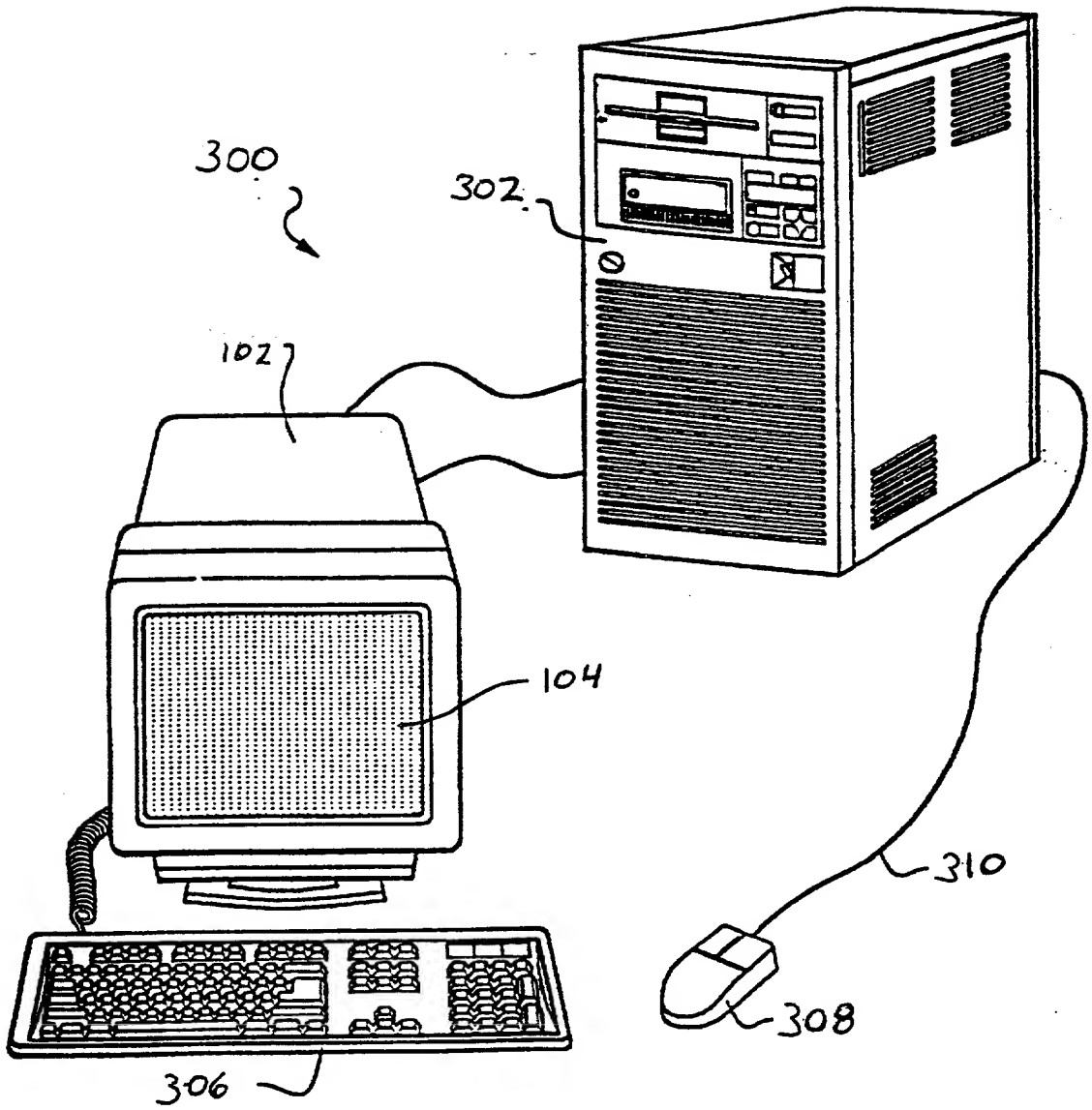
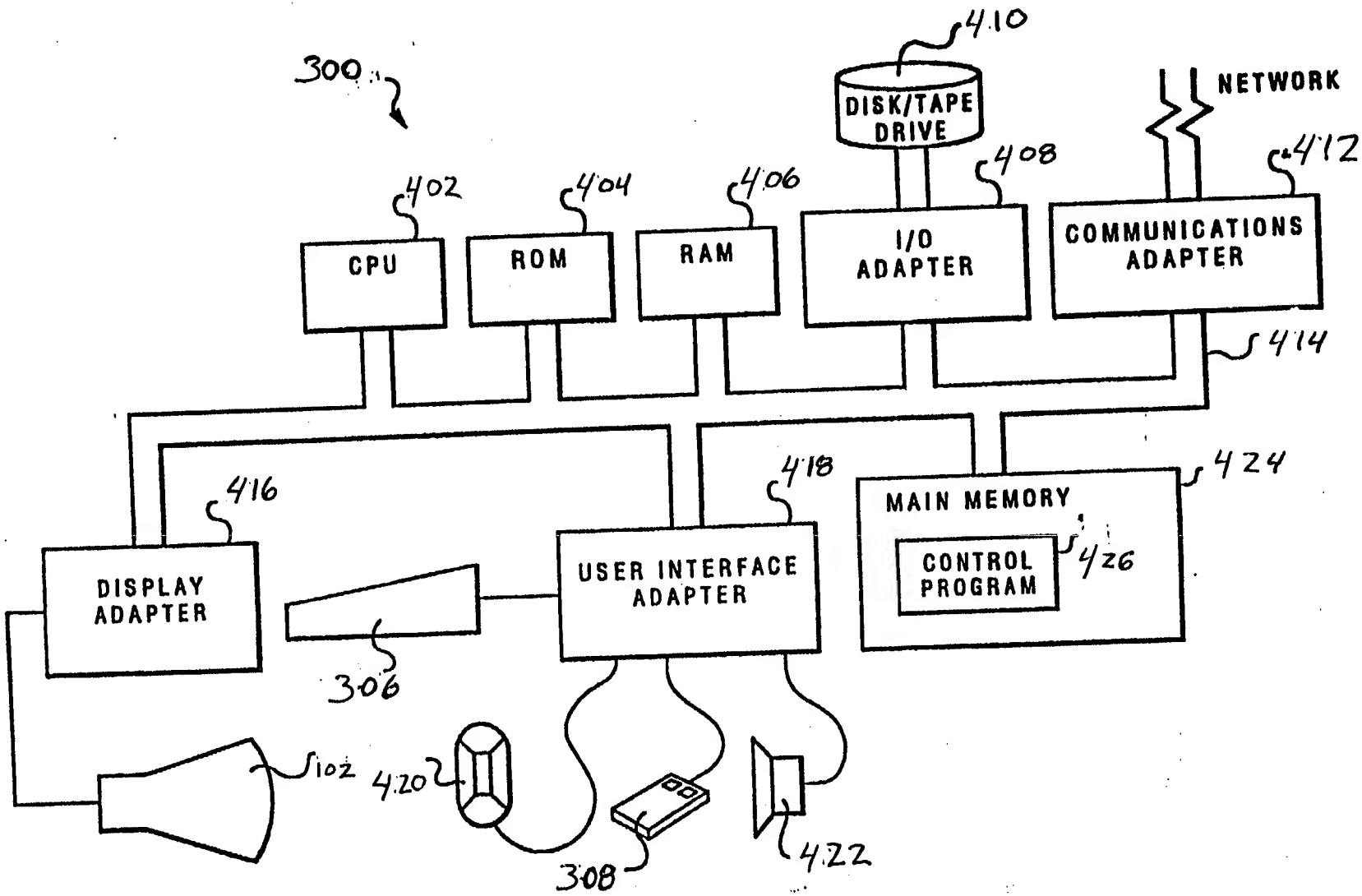


FIG. 3

FIG. 4



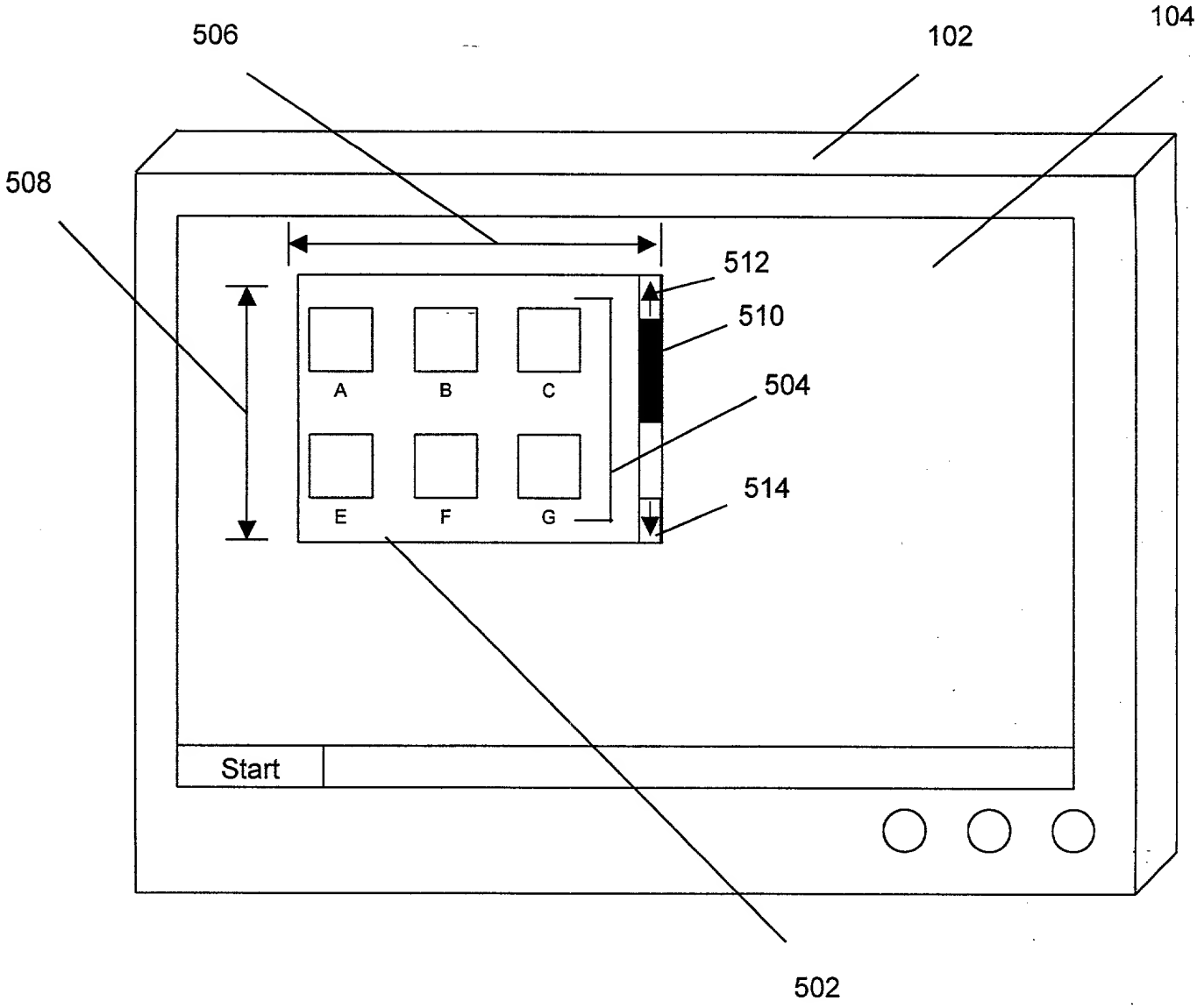


FIG. 5a

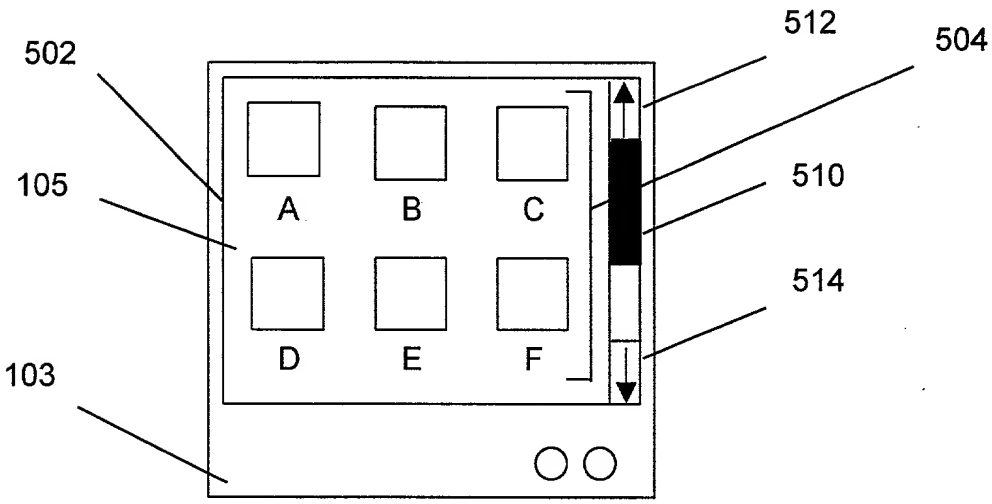


FIG. 5b

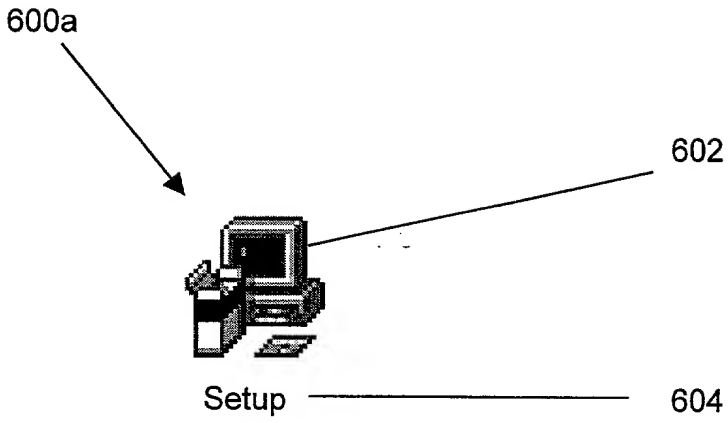


FIG 6a

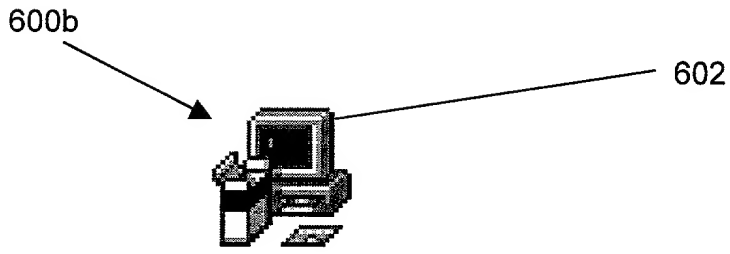


FIG 6b

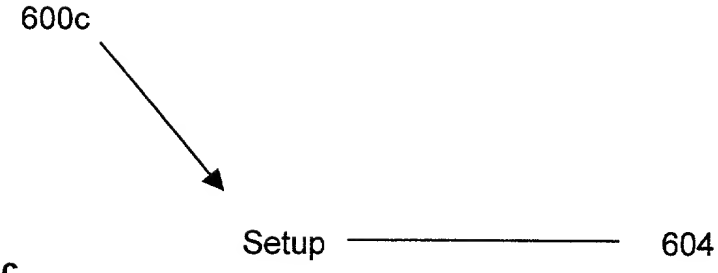


FIG 6c

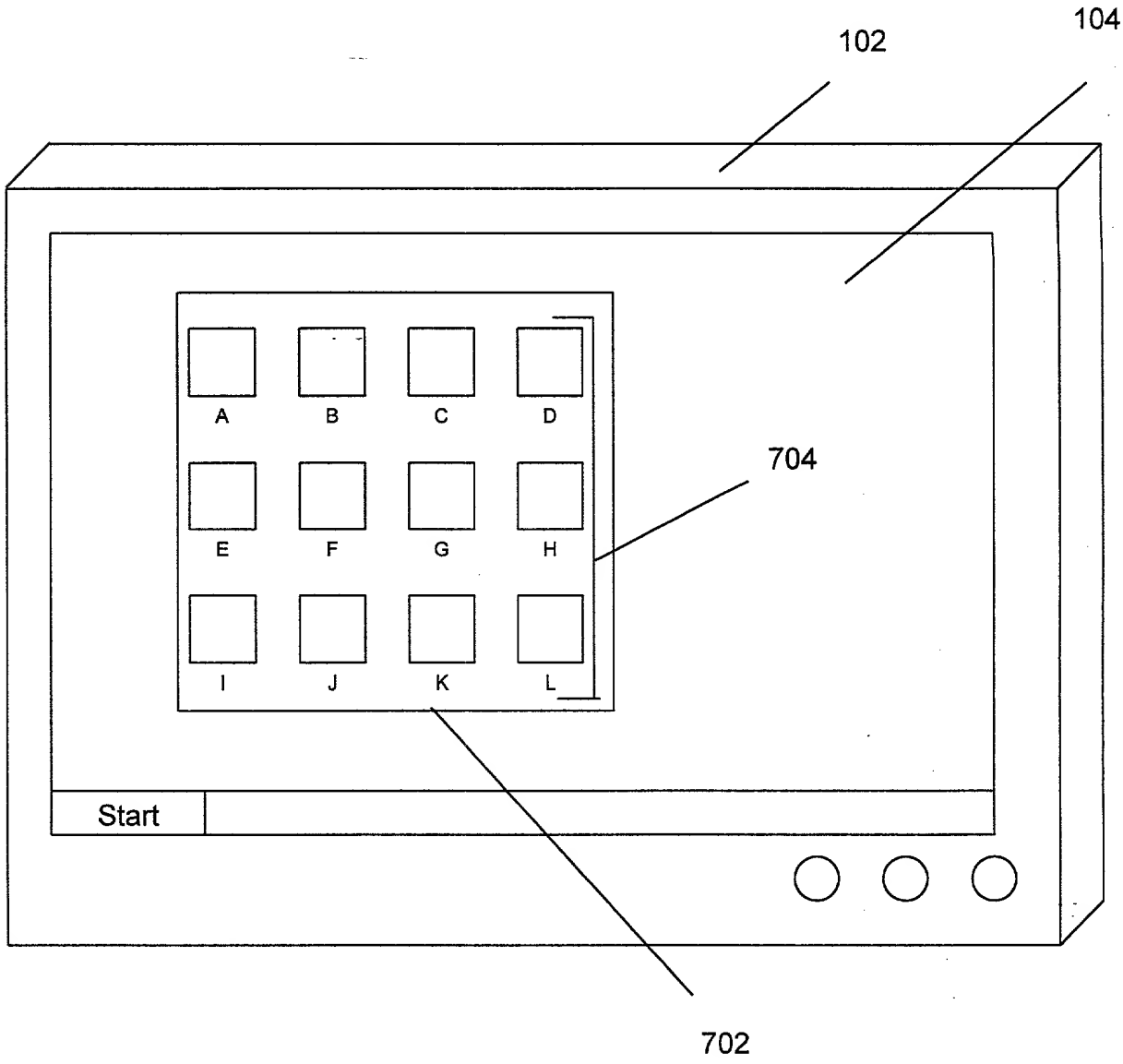


FIG. 7a

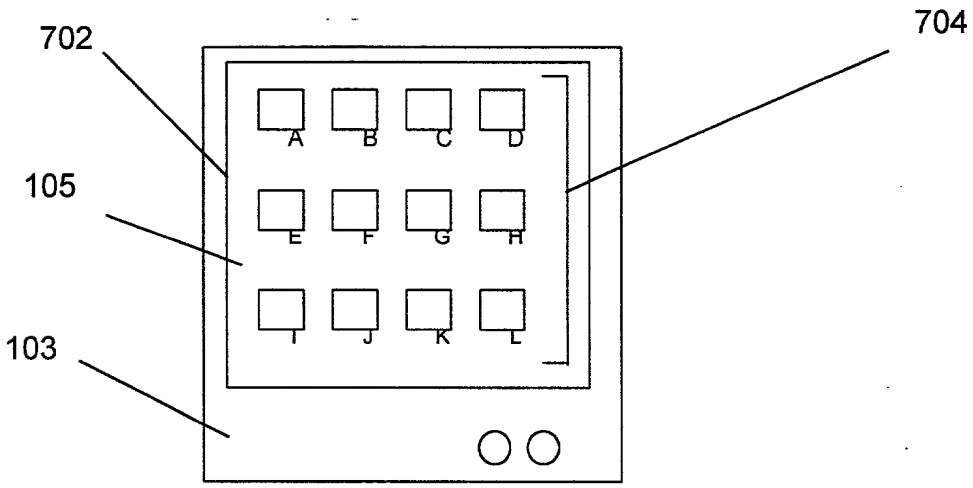


FIG. 7b

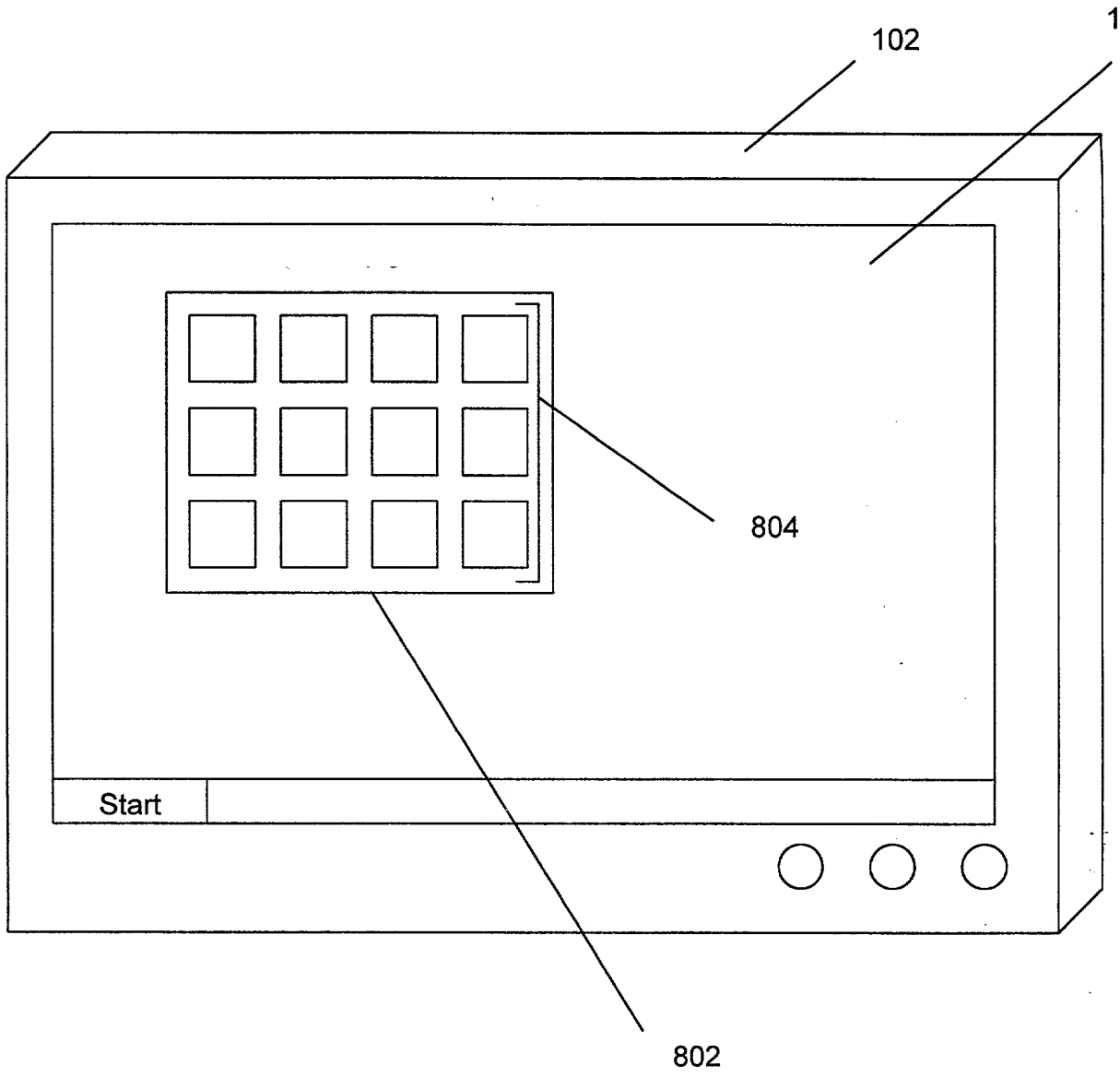


FIG. 8a

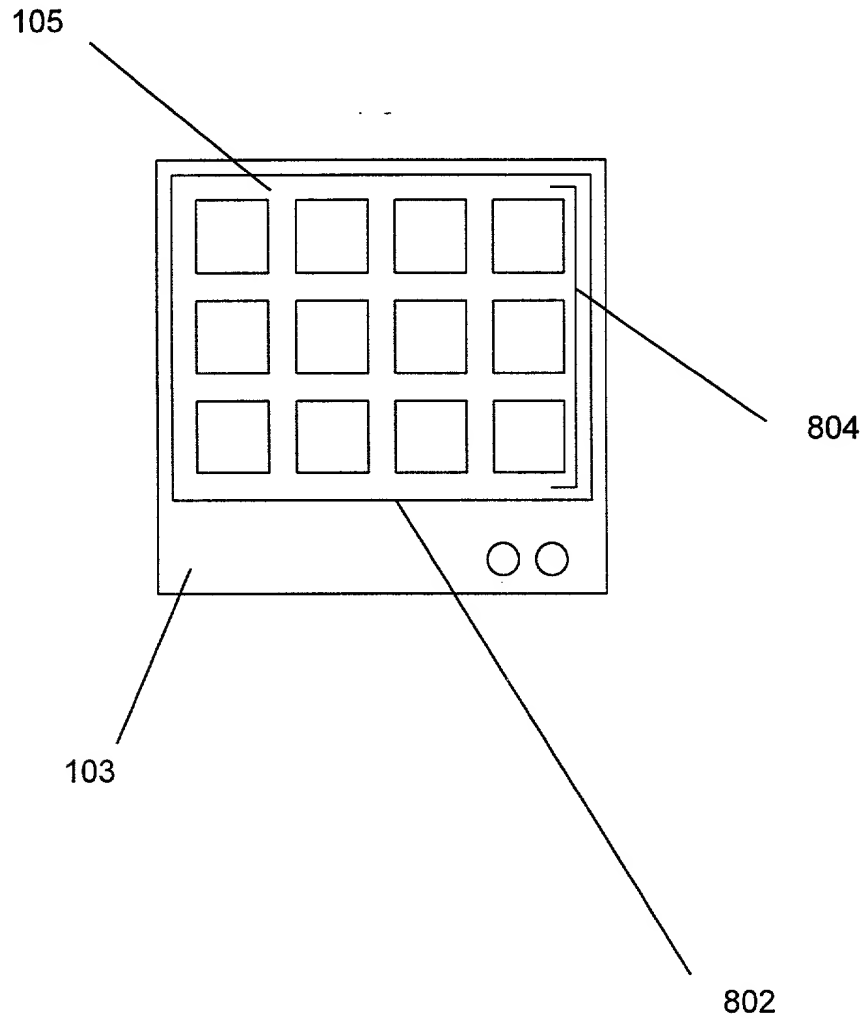


FIG. 8b

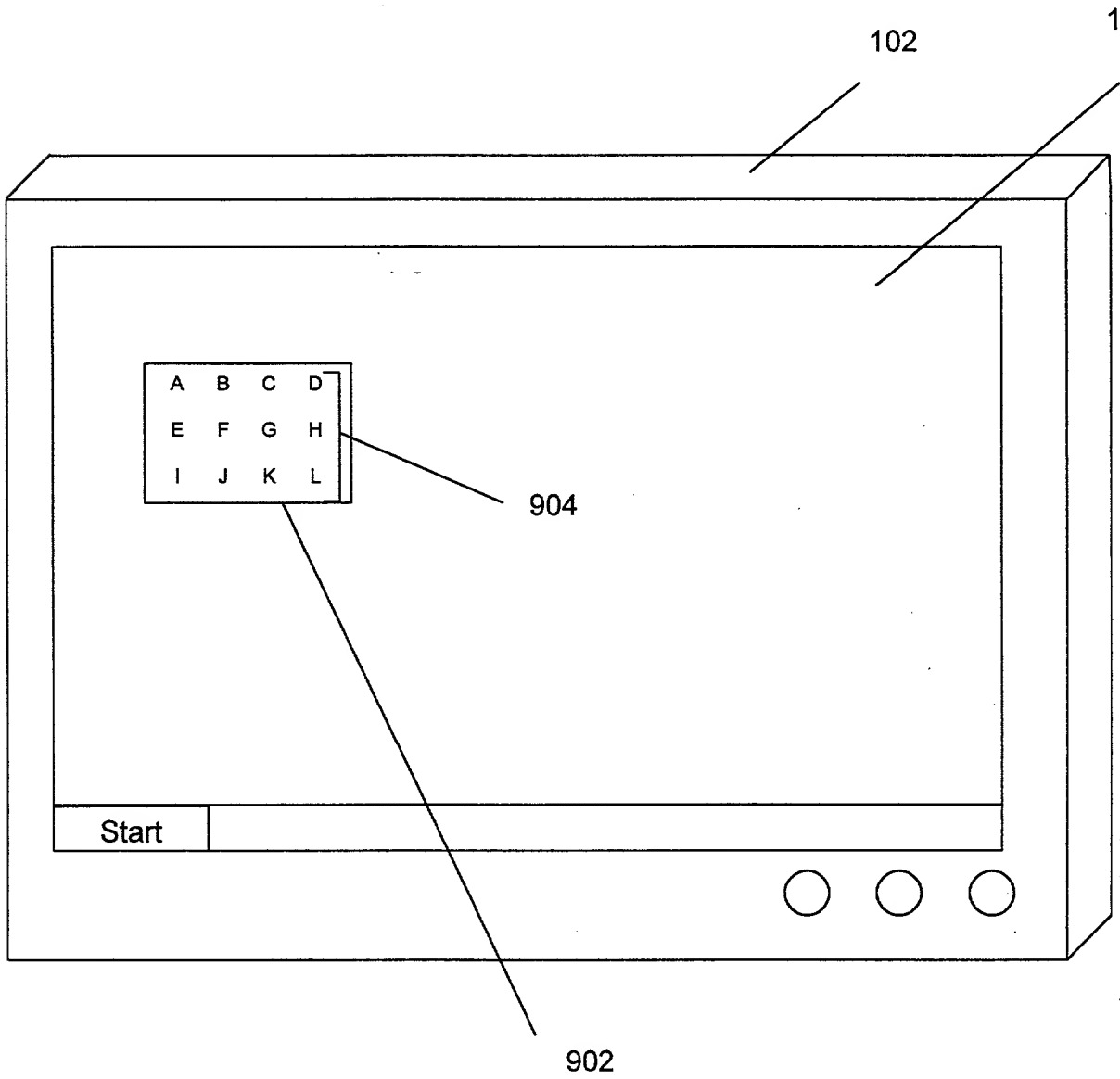


FIG. 9a

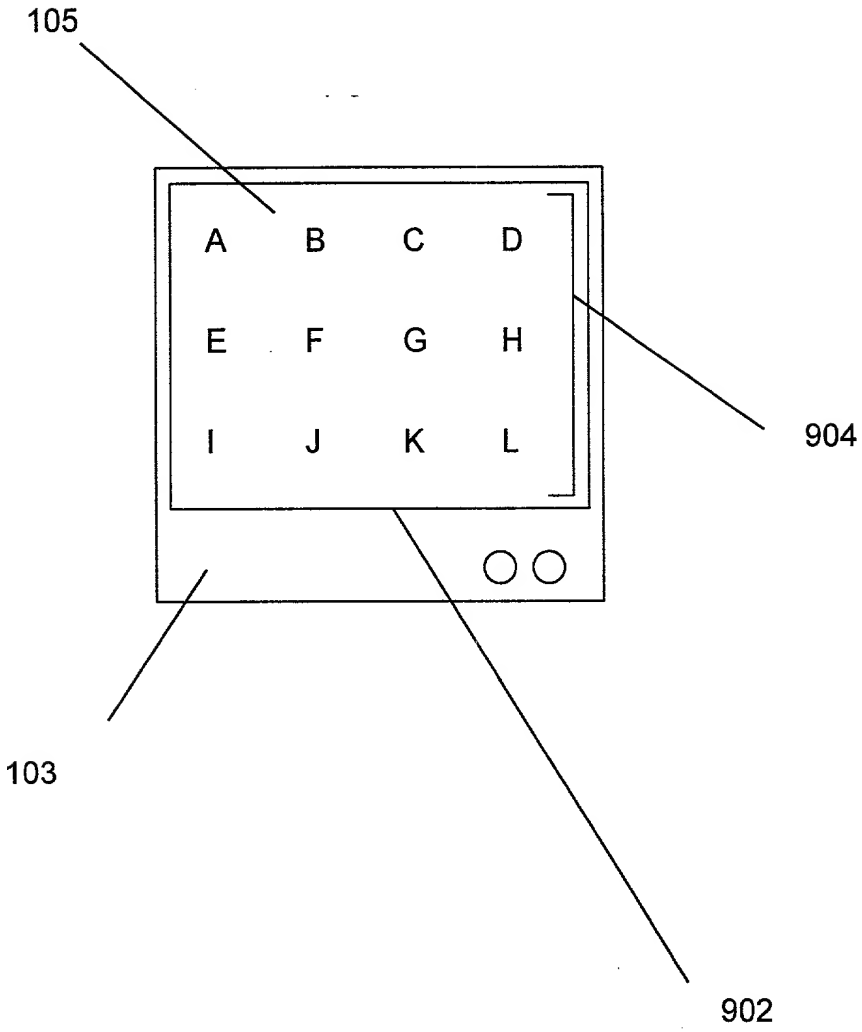


FIG. 9b

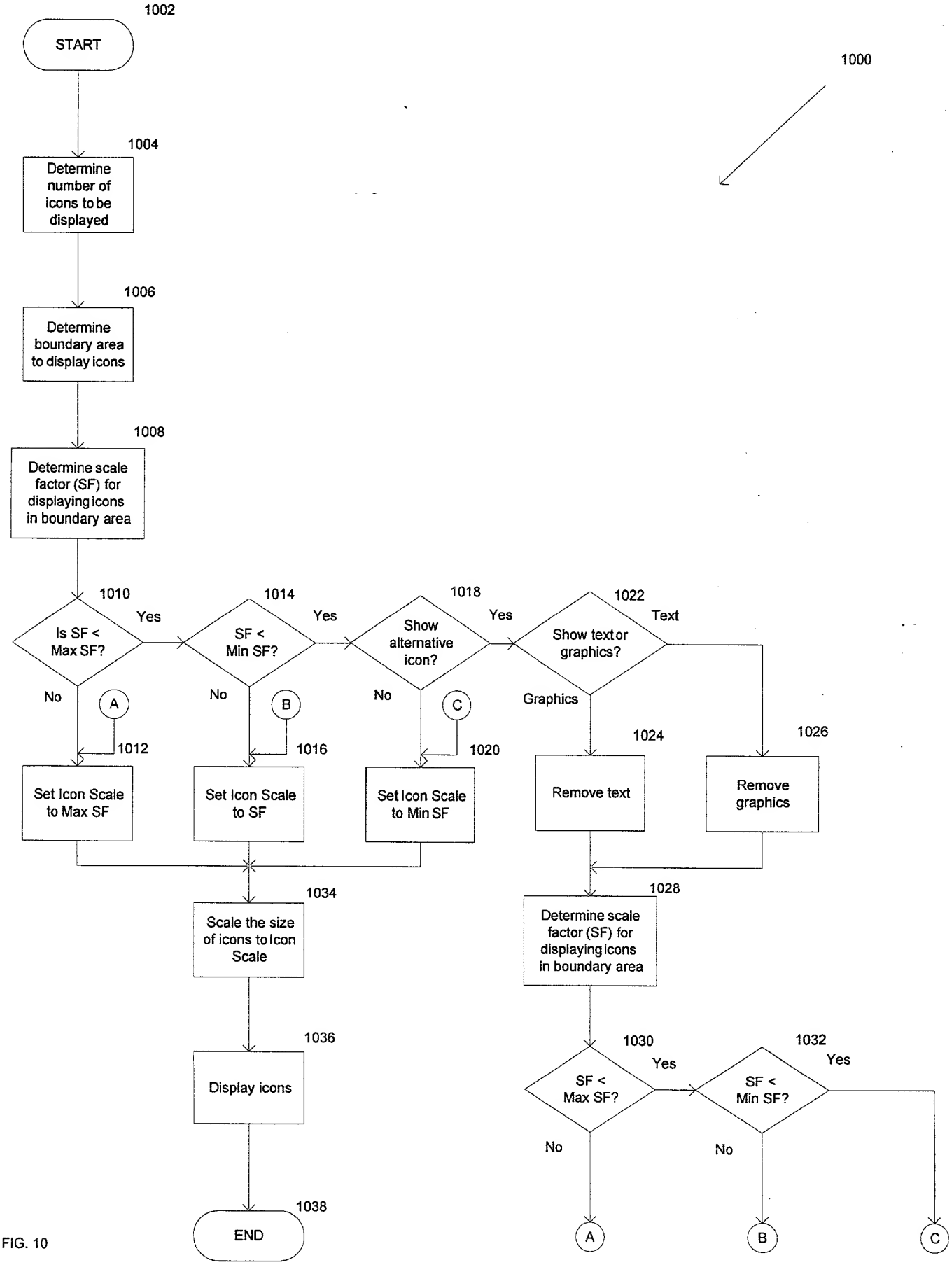

1000
1002
START
1004
Determine number of icons to be displayed
1006
Determine boundary area to display icons
1008
Determine scale factor (SF) for displaying icons in boundary area
1010
Is SF < Max SF?
Yes
No
A
1012
Set Icon Scale to Max SF
1014
SF < Min SF?
Yes
No
B
1016
Set Icon Scale to SF
1018
Show alternative icon?
Yes
No
C
1020
Set Icon Scale to Min SF
1022
Show text or graphics?
Text
Graphics
1024
Remove text
1026
Remove graphics
1028
Determine scale factor (SF) for displaying icons in boundary area
1030
SF < Max SF?
Yes
No
A
1032
SF < Min SF?
Yes
No
B
C
1034
Scale the size of icons to Icon Scale
1036
Display icons
1038
END

FIG. 10

DOCKET NUMBER: AUS000065US1

DECLARATION AND POWER OF ATTORNEY FOR

PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

AUTOMATICALLY SCALING ICONS TO FIT A DISPLAY AREA WITHIN A DATA PROCESSING SYSTEM

the specification of which (check one)

X is attached hereto.

__ was filed on _____
as Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):			Priority Claimed
_____ (Number)	_____ (Country)	_____ (Day/Month/Year)	___ Yes___ No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information material to the patentability of this application as defined in Title 37, Code of Federal

DOCKET NUMBER: AUS000065US1

Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial #)	(Filing Date)	(Status)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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INVENTORS SIGNATURE: Rabindranath Dutta DATE: 6/15/2000

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